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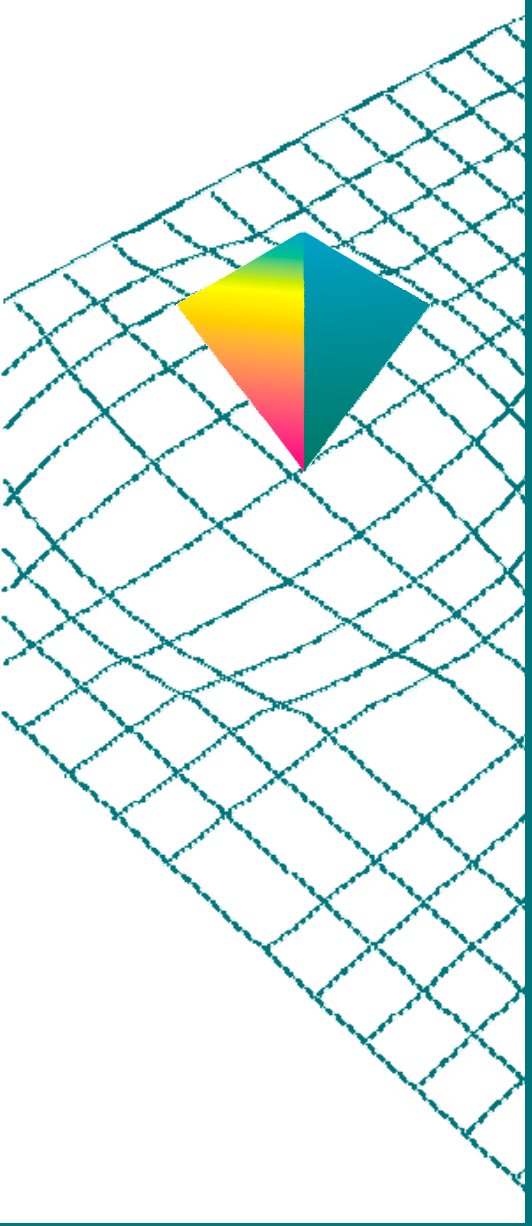

# Maschinenbau von Makro bis Nano / Mechanical Engineering from Macro to Nano

## Proceedings

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50. Internationales Wissenschaftliches Kolloquium
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E. I. Yablochnikov / V. V. Koshelev / M. M. Shalnov

# The manufacture preproduction automated system (MPPAS) for the machine-building enterprises

The effective utilization of all amount of information on a product, created by various experts on their places, is necessary for the further increasing of manufacture preproduction (MPP) efficiency. This problem can be solved by creation Collaborative Workspace (CWS) on based on PDM systems. It is known, that PDM systems are intended for supporting of the electronic description of a product at all stages of its life cycle. However, today in the most cases these systems are used only at a product design stage. Great volume of the information created during product engineering process development, as a rule, remains out of PDM. The offered MPPS prototype represents a complex of techniques to organize different experts workplaces based on CAD/CAM/CAE-systems and CWS based on a PDM-system.

The MPPAS prototype was created using the licensed software of leading world developers. CATIA V5 (the developer - Dassault Systemes Corp.), one of the most modern CAD/CAM/CAE systems, has been chosen for a main product design. A CAD/CAM system Cimatron E (the developer - Cimatron Ltd.) has been chosen for aids and tools (instruments) design. Depending on features of the developing product corresponding modules CATIA V5 or Cimatron E are used to develop programs for machines with numerical control (NC). The system Vericut (the developer - CGTech Inc.) has been chosen for the verification, visualization and tuning of developed NC programs. The system IMSpost (the developer - IMS Inc.) has been used for development of postprocessors using NC programs for specific machines. Software products SuperForge, SuperForm, Marc, etc. (the developer - MSC.Software Inc.) – to solve specific tasks of the engineering analysis while working on mold processes. The PDM-system SMARTEAM V5 (the developer - affiliated company of Dassault Systemes Corp.) has been chosen for CWS creation and product data management.

As enterprises use different CAD/CAM/CAE/PDM systems, the given variant is the prototype presents a capability of MPPAS creation. Integrations of all systems have to be done while the realization (implementation) MPPAS on enterprises are necessary. Each integration project has to be carried out basing on a separately developed specification.

During development of the prototype the objects classification of the specific domain MPP has been done and on this base the typical information model (as a foundation of CWS) was built using methods of object-oriented programming (OOP) and UML.

Typical graphical user interfaces of MPPAS users according to their roles in manufacture process have been developed and the auxiliary programs (scripts) which supplement standard functions of the PDM system by specific features for each MPP stage were written basing on requirements of local standards.

The prototype stability was tested and validated using different DBMS (Oracle, MS SQL, Interbase). Integration of PDM SMARTEAM with CAD-systems CATIA, SolidWorks, AutoCAD, Cimatron has been performed.

The important practical implementation of this MPPAS prototype is its using as a foundation of the educational & methodical complex is creating in the Saint-Petersburg State University ITMO intended for training of students and improvement of professional skill of engineers and professors of

high schools of Russia Northwest region.

The main principles of PLM (Product Lifecycle Management), incorporated by IBM/Dassault Systemes Corp. into the software, were taken into account during the implementation of the MPPAS prototype

- Orientation to business-processes for each industry (ProcessCentric);
- Common information space for all participants of work above a product (CollaborativeWorkspace);
- The unified description of a product, its creation process and the resources necessary for the performing of this process (PPR – ProductProcessResource);
- Accumulation and re-using of the knowledge for creation of new products(Knowledge);
- The open architecture allowing beyond all bounds to expand and improve the system functionality by 3rd-party developers (CAA Component Applications Architecture).

Thus, as a result of the creation of the MPPAS prototype the methodological bases for automation of the most of manufacture preproduction processes using advanced information technologies and taking into account tendencies of world industrial production development were founded, and practical realization of this prototype was carried out.

The further goals of MPPAS development and improvement on a way to create completely digital «future factories» are:

- More detailed development and practical implementation of Workflow processes;
- Detailed elaboration of issues of integration with ERP-systems;
- Investigation of issues and working over the techniques of MPPAS in the distributed {allocated} expanded enterprise using the Internet Portals;
- Integration DELMIA software in MPPAS framework;

Faculties of technical universities of Saint-Petersburg and Kazan are taking a part in the decision of these issues.

Practical using of the offered system and the developed organizational-methodical maintenance of working of experts via the enterprise CWS will allow to accelerate design and manufacture preproduction processes due to parallel performance of works and electronic data exchange between collaborators; to improve quality and reliability of the information; to save up and store the information in an electronic kind, to train the staff to introduction of PLM-technologies.

It gives preconditions for improving of the enterprise competitiveness abilities; for full the MPP management reorganization based on business processes reengineering and PLM introduction and it is a necessary stage on a way to establishing of «future factory».

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